CHAPTER IV G

Grassland Resource Conservation District Alternative Plans

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
MID-PACIFIC REGION

CHAPTER IV G

GRASSLAND RESOURCE CONSERVATION DISTRICT

The Grassland Resource Conservation District (GRCD) is comprised of 75,000 acres situated north and southeast of the City of Los Banos. Of this total acreage, approximately 60,000 acres are seasonal wetlands with the remainder utilized for pasture or cropland.

The Grassland Water District (GWD) was formed in 1953 and primarily consists of 156 duck clubs. The 52,000 acre area served by GWD contains 47,000 acres of privately owned wetlands, and is within the GRCD as described above. GWD is divided into two divisions: the 31,000-acre northern area lies one mile north of the City of Los Banos and southeast of Gustine, extending 12 miles north to the Kesterson NRW boundary; the southern area, which contains 21,000 acres, is located three miles southeast of Los Banos and west of Dos Palos. GRCD and GWD are both discussed in this chapter because of their interrelationship.

As shown on Figure IV G-1, included within the GRCD boundaries are the 52,000 acres of the GWD, 3,200 acres of the Los Banos Wildlife Management Area, 3,000 acres of the Volta Wildlife Management Area, 5,900 acres of Kesterson National Wildlife Refuge, and 10,000 acres of privately owned wetlands. The GRCD is managed by the Service although Los Banos WMA and Volta WMA are managed by DFG. This area, commonly referred to as the west Grasslands, represents the largest contiguous block of wetlands remaining in the Central Valley and is a major wintering ground for the migratory waterfowl of the Pacific Flyway. Up to 30 percent of the Pacific flyway wintering population of duck species use this area.

These wetlands are the remnants of a much larger seasonal wetlands complex that historically extended throughout the Central Valley. The wetlands are characterized as shallow wetlands that maintain standing waters during the rainy season but are depleted of soil moisture during the summer. The Service ranked the habitat provided by the GRCD as the most important wetlands in the San Joaquin Valley.

Wetland habitat has been maintained since 1972 through the Water Bank Program which provides financial incentive to landowners to maintain their land as wetland habitat, as well as providing technical assistance from various State and Federal agencies. Recently, the program has been broadened to encourage increased production of food plants for waterfowl (ESA, 1987).

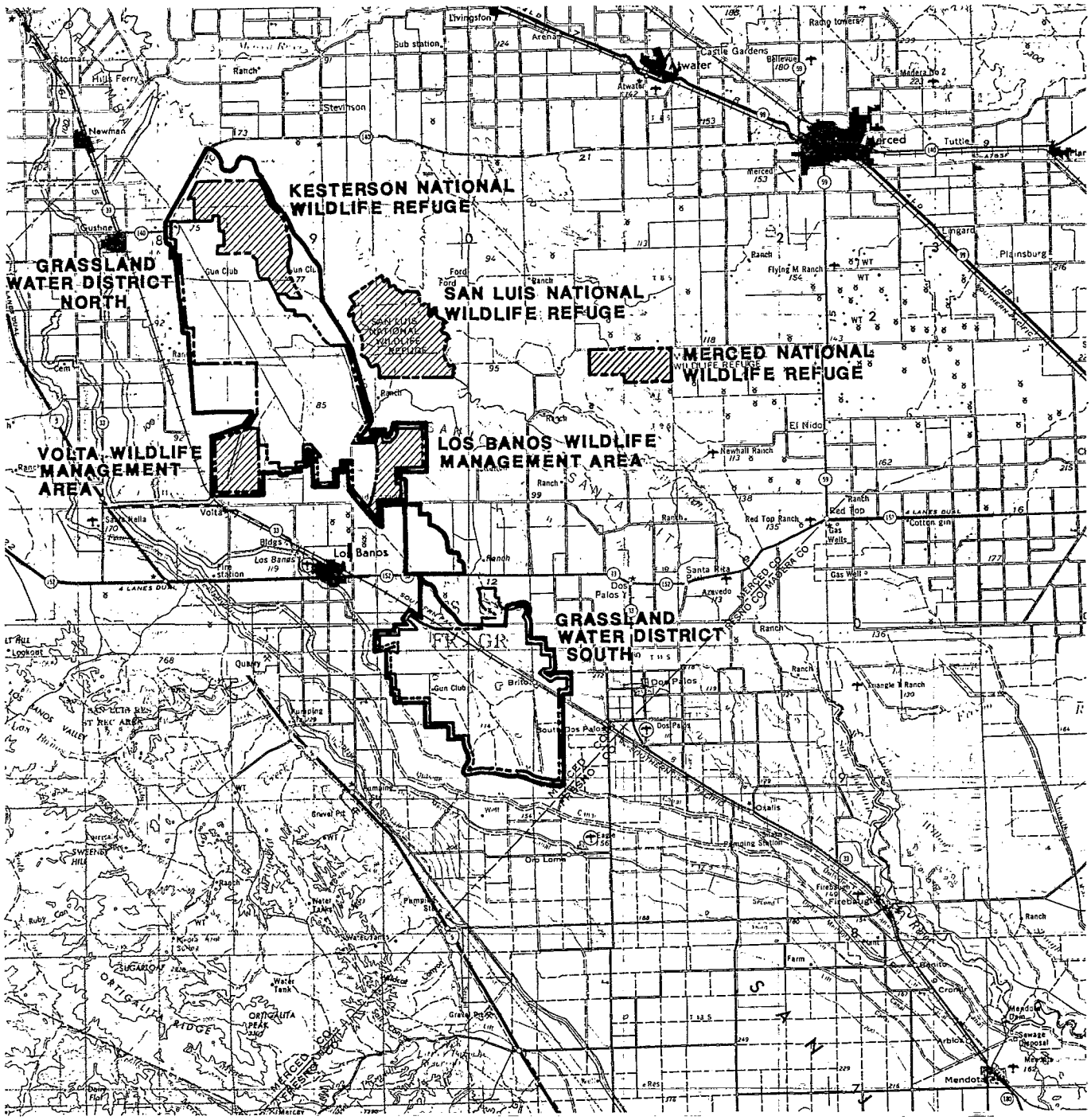

FIGURE IV G-1

GRASSLAND VICINITY

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Although a management plan does not exist, and the Club owners manage their lands somewhat independently, the GRCD management objectives include managing for different plant species that provide waterfowl food and habitat, primarily swamp timothy and wild millet.

To preserve waterfowl habitat, perpetual easements on about 26,000 acres within the GRCD have been purchased by the Service. These easements authorize the Service to restrict uses of the land that would diminish its value as waterfowl habitat. The purpose of the easement acquisition is to assure that wintering habitat will continue to be preserved and managed for migratory waterfowl (GWD, 1987).

Land uses within the GWD consists of seasonal wetlands and agricultural lands. Approximately 37,000 acres of GWD are seasonally flooded inland marsh, 1,400 acres are in permanent pasture use, 13,500 acres are in native pasture, 2,000 aces are in agricultural crop production, and less than 1,000 acres are occupied by building sites (ESA, 1987).

A. WATER RESOURCES

70- to 80-percent of the acreage within the GWD is managed to provide habitat for wintering waterfowl. The agricultural lands receive drain water only and are managed for permanent pasture and other agricultural crops such as sugar beets, alfalfa, and cotton. Lands converted to agriculture in wetlands areas are not eligible to use CVP water.

Currently, GWD lands are flooded from September 1 to January 15 to an average depth of 18 inches over 70 to 80 percent of the total area. Some owners drain their land shortly after the duck season ends in mid-January. However, there are an increasing number of owners who hold their water until mid-March to provide late winter habitat. Around May 15 of each year, the areas are flood irrigated with about six to eight inches of water for five to ten days to stimulate the growth of waterfowl food plants. If water is available, some owners irrigate once more in July.

1. Surface Waters

To supplement a contract supply from Reclamation and to provide water for the balance of the year, the GRCD has relied on the use of agricultural return water (subsurface and surface drainage) and operational spill from upslope irrigation and water districts. Private wetlands within GRCD have depended upon the receipt of agricultural return flow from neighboring farm lands, deep wells, or where feasible, have contracted for the delivery of water from other local water agencies. The agricultural return water utilized by GRCD had been arranged for through a series of contracts between the GWD, the upslope districts, and farmers with agricultural return flow quality standards imposed by GWD.

Estimated annual water requirements and existing water supply for the GWD are 150,000 acre-feet and 50,000 acre-feet, respectively. The 180,000 acre-feet is the estimated 50,000 acre-feet for GRCD. This amount does not include the estimated need for Kesterson NWR, Volta NWR, Los Banos WMA, or GWD. The existing supply does not include water from agricultural return flows, surplus surface water, or groundwater. The primary problem at the GRCD is receiving adequate water supplies in a timely manner.

GWD has a contract for 53,500 acre-feet annually. This water is to be used between September 15 and November 30 only. The water is provided by the Reclamation at no cost with the condition that the GWD maintain at least 80 percent of its lands in wildlife habitat by suitable covenants (GWD, 1987). The water is delivered through the Delta-Mendota Canal and the Central California Irrigation District (CCID) system.

In 1953, congressional legislation was passed to authorize the CVP to develop and furnish water for waterfowl management purposes; 50,000 acre-feet per year of CVP water was made available for such use in the grasslands area. The GWD was formed under the California Water Code in 1953 to provide a legal entity to contract for the 50,000 acre-feet per year and to assume responsibility for the distribution of water and maintenance of facilities within the district. Thereafter, GWD serviced the area with 50,000 acre-feet of CVP contract water and drainage water. In 1963, GWD initiated a successful protest of the Reclamation water right on the Los Banos Creek project and received an additional 3,500 acre-feet annually of CVP water. This increased the total contracted CVP water to 53,500 acre-feet per year. As a result of a subsequent agreement, GWD now delivers 3,500 acre-feet per year of fresh water to the Service and 4,000 acre-feet per year of agricultural return flows if and when available and requested from DFG for waterfowl management purposes (GWD, 1986).

The GWD has water rights for diversion of up to 2,400 acre-feet per year from Los Banos Creek from June 1 to December 31 each year. These rights are no longer subject to prior rights. The agricultural return flows were obtained by agreements with outlying irrigation districts (USFWS, 1978e).

To supplement the GWD contract supply and to provide water for the balance of the year, the area has relied on the use of agricultural return flows water and operational spills from upslope irrigation and water districts. However, due to contamination of agricultural return flows, the use of this water has been mostly discontinued. This has resulted in the loss of up to as much as two-thirds of the former water supply (GWD, 1987). Table IV G-1 lists water delivered to the GRCD.

The Kesterson Problem. During the spring and summer of 1983, serious waterfowl reproductive problems were observed involving the twelve 100-acre ponds on the Kesterson NWR, which is within the GRCD boundary. Studies revealed that selenium

TABLE IV G-1

WATER DELIVERIES

GRASSLAND RCD

(acre-feet)

Year	Total
1977	(a)
1978	69,378
1979	104,985
1980	107,638
1981	108,584
1982	119,572
1983	98,253
1984	109,697
1985	92,506

(a) Data not available

Source: USFWS, 1986h

toxicity was a suspected cause of these problems. Until these problems were discovered, agricultural drainwater was seen as a new source of water for creating wetlands.

The Kesterson ponds served as the terminus for the USBR's San Luis Drain. The San Luis Drain is part of a major project designed to remove subsurface irrigation drainage waters from portions of San Joaquin Valley farmlands. An undetermined acreage of these irrigated lands is thought to be the source of the selenium contamination that is causing the toxicity at the Kesterson ponds.

In 1984, shortly after reproductive problems were identified at the refuge, a hazing operation was initiated to discourage waterfowl from using the area. In 1985, the State Water Resources Control Board issued a cleanup and abatement order, which was followed by a cleanup and closure order from the Secretary of the Interior. Although complete implementation of these orders may take up to several years, the value of the Kesterson pond habitat to waterfowl has been lost.

The Kesterson problem has created an uncertain future for other planned and operational projects in the Valley that involve using subsurface irrigation drainage waters to create waterfowl habitat. In the Grassland area, 148,000 acre-feet of drainage water have been used annually for maintaining waterfowl habitat. (USBR, 1986d). However, upon the discovery that much of the subsurface drain waters entering the area contain amounts of selenium and other contaminants, the use of this water has been discontinued. This has caused perhaps as much as two-thirds of the former water supply to no longer be available. A series of one year contracts will be implemented with the Reclamation to provide a supplemental water supply of up to 100,000 acre-feet annually to lands within the GWD, however, the cost ($12/af) of this temporary supply would most likely preclude its use on a widespread or continuing basis (GWD, 1987).

2. Water Conveyance Facilities

Water from the Mendota Pool is routed through the CCID Main and Helm Canals to the southern boundary of the southern GRCD area. The northern area receives water from several sources Water is diverted from the Main Canal into Garzas Creek which spills into Los Banos Creek. Delta Mendota Canal (DMC) Water delivered through CCID's Main Canal can originate at the Mendota Pool or it can be diverted directly from the DMC at the Wolfson Bypass. Currently, the only water received from the Mendota Pool is that water ordered under contract with Reclamation and delivered to the Pool through the DMC. Water is also supplied from the Delta-Mendota Canal through the Volta Wasteway into Mosquito Ditch, which enters GRCD near the southwest corner of the northern division. The Santa Fe Canal, when carrying fresh water, is also used as a conveyance facility for the northern area.

The fresh water is high quality CVP water; the agricultural return flows are of poor quality and are considered unsuitable for wildlife and irrigation. The CCID and Reclamation normally de-water their systems, including the Mendota Pool, between November 15 and January 15 every 4- to 5-years. The de-watering operation prevents the delivery of water to a major portion of the District during this critical period. Negotiations have been completed between the GWD and CCID to provide for the transportation of water supplies which may be made available at other times during the year.

Northern GRCD is supplied by Garzas Creek on the northwest side, Volta Wasteway on the southwest side, and the Santa Fe Canal and the San Luis Canal on the east and southeast sides. Eagle Ditch distributes water from the Santa Fe Canal north.

Approximately 70 percent, or 35,000 acre-feet, of the GWD's fall contract water supply requirement must be conveyed through the canals of the CCID. The need to separate incoming drainage flows from fresh water supplies has caused conveyance and delivery problems. However, with the aid of funding from the State Resources Agency and the Wildlife Conservation Board, facilities to allow for the separation of flows have been and are being constructed.

The Porter Blake Bypass has been constructed to divert unusable agricultural drain flows which enter the southern GWD at Camp 13 and the Agatha Canal, into Mud Slough. This Bypass allows fresh-water deliveries to be made via the San Luis Canal into northern GWD, Los Banos Wildlife Area, and Kesterson National Wildlife Refuge.

The GWD has completed a project to separate fresh water supplies from drain water for the south GWD. The Agatha/Geis/Camp 13 canal system distributes water within this southern division of GWD as shown on Figure IV G-2. This separation project allows the GWD to alternate the conveyance of fresh water between the Agatha, Geis, and Camp 13 Canal Systems. The separation project allows landowners to flood and irrigate the marshlands when fresh water is flowing in the adjacent canals and allow agricultural drainage water to be bypassed to Mud Slough. The planned improvements would increase the capacity of the system to approximately 225 cfs.

The lands within the GRCD are subject to flooding from several of the natural streams which traverse the area. Operational modifications on the Los Banos Creek Detention Dam have reduced the frequency and extent of flooding. The northernmost portions of the GRCD continue to be impacted by uncontrolled run-off in Garzas Creek (GWD, 1985, 1987).

Water levels within the GRCD are affected by the maintenance of the CCID canals, the Delta-Mendota Canal, and the Mendota Pool. Maintenance to the CCID canals usually occurs between Novem-

TABLE IV G-2

DEPENDABLE WATER SUPPLY NEEDS

ALTERNATIVE SUPPLY LEVELS FOR THE GRASSLAND RCD

Month	Supply Level 1		Supply Level 2		Supply Level 3		Supply Level 4	
	ac-ft	cfs	ac-ft	cfs	ac-ft	cfs	ac-ft	cfs
January	0	0.0	3,000	48.8	5,200	84.6	5,200	84.6
February	0	0.0	0	0.0	6,000	108.0	6,000	108.0
March	0	0.0	0	0.0	5,800	94.3	5,800	94.3
April	0	0.0	5,000	84.0	9,100	152.9	9,100	152.9
May	0	0.0	12,000	195.2	25,700	418.0	25,700	418.0
June	0	0.0	12,000	201.7	20,800	349.6	20,800	349.6
July	0	0.0	0	0.0	5,800	94.3	5,800	94.3
August	0	0.0	4,000	65.1	8,200	133.4	8,200	133.4
September	10,000	168.1	25,000	420.1	25,800	433.6	25,800	433.6
October	30,000	487.9	36,000	585.5	38,600	627.8	38,600	627.8
November	10,000	168.1	19,000	319.3	19,300	324.3	19,300	324.3
December	0	0.0	9,000	146.4	9,700	157.8	9,700	157.8
Total	50,000	824.0	125,000	2,066.0	180,000	2,978.5	180,000	2,978.5
Maximum	30,000	487.9	36,000	585.5	38,600	627.8	38,600	627.8

Notes:

Alternative 1 Existing firm water supply
Alternative 2 Current average annual water deliveries
Alternative 3 Full use of existing development
Alternative 4 Optimum management

Source: USFWS, 1986g

ber and February of each year. Water is drawn down or drained from the facilities during these times. The lower portion of Delta-Mendota Canal is also drawn down for maintenance periodically, usually in November-December. Dewatering takes place when maintenance activities require it. There are no plans for future dewatering on the upper portions of Delta Mendota Canal. The loss of water in November constrains management of waterfowl habitat and the use of the area for public use. Delivering a supply of water to the District at the appropriate times would alleviate the principal water conveyance problem. The Delta-Mendota Canal does not have sufficient capacity to convey an additional 130,000 acre-feet annually.

3. Groundwater

Most of the GRCD is located on land deposits created from overflow of the San Joaquin River. Portions of the GRCD on the eastern side lie within the San Joaquin floodplain and in channel deposits.

Two water bearing zones are present under the surface and are separated by the Corcoran Clay, an approximately 100-foot thick layer of clay at about a 200-foot depth. Records from wells in the general area of the GRCD show that pump yield for irrigation wells range from 675 to 2,100 gallons per minute. The dissolved solids concentration of groundwater from the well data indicate generally high concentrations of salts above the Corcoran Clay. Water below the clay layer is generally of better quality with total dissolved solids below 2,000 ppm. Water quality from the deep zone should be suitable for both irrigation and waterfowl habitat (USFWS, 1978).

Groundwater pumping facilities are present on 15 of the 165 gun clubs within the GWD. Excessive pumping costs and generally poor quality groundwater preclude the use of these wells for anything other than a supplemental supply on a very limited basis (GWD, 1987). Reclamation estimates that 71,500 acre-feet of groundwater could be pumped from below the clay layer to supply the entire GRCD.

4. Offstream Storage

There is a need for additional Central Valley Project yield within the San Joaquin Valley to relieve the groundwater overdraft, and to provide additional water needed for agricultural, municipal, and fish and wildlife purposes. Offstream storage is surplus water which could be pumped from the Sacramento River, or the Delta during times when the system is operating at less than maximum capacity, stored until needed, and then delivered during times when canal capacity is available.

Reclamation began investigating various potential offstream storage sites within the San Joaquin Valley in October 1985. The California Waterfowl Association subsequently (1987) requested that the GRCD be included as a potential offstream storage site, whereby wetlands could be enhanced for the benefit of waterfowl and at the same time, increase project yield.

An evaluation of GRCD lands for offstream storage on wetland habitat was conducted for Reclamation by Boyle Engineering Corporation. The results of this evaluation were published in a 1987 report entitled "An Evaluation of Wetland Habitat for Offstream Storage". The report indicates that an opportunity for offstream storage within the GRCD does exist. However, the exact amount of return flow varied according to water operations. The report pointed out that more information is needed relative to seepage, evaporation, water quality and impacts on wildlife to determine the viability of an offstream storage program within the GRCD.

In October, 1987, Reclamation entered into a cooperative agreement with the GWD to perform, on a cost-sharing basis, a pilot study to assess the potential for the use of wetlands within the GRCD as an offstream storage site. The primary purpose of this one year study is to obtain additional data on seepage, evaporation, and water quality. The study may be extended and expanded in scope if the first years results are positive. Reclamation would provide up to 36,000 acre-feet of water to GRCD for distribution onto approximately 16,000 acres of wetlands. The results of the water application would be monitored to determine storage potential of those lands.

As information relative to off-stream storage on GRCD becomes available, it will be appropriatly incorporated into the REfuge Water Supply Planning Report. If the data from the study is favorable, off-stream storage may become a component of a plan to provide the GRCD with dependable water supplies.

B. FORMULATION AND EVALUATION OF ALTERNATIVE PLANS

In the past, wildlife areas have relied upon surplus surface water, agricultural return water and groundwater for meeting water needs. To provide for full development of the District, the annual water requirement is estimated by the Service to be 180,000 acre-feet per year. However, for the purposes of assessing the impacts of water delivery alternatives, four levels of water supply have been identified and are presented in Table IV G-2.

Each of the water supply levels provide a different rate and volume of water, summarized as follows:

Level 1 - Existing firm water supply

Level 2 - Current average annual water deliveries

Level 3 - Water supply needed for full use of existing development

Level 4 -Water delivery needed for optimum management

Multi-objective project evaluation procedures, in accordance with concepts outlines by the Water Resources Council, is one of the tools used in evaluating and comparing alternatives. The Water Contracting EIS's would evaluate the national, regional, and site-specific environmental impacts of providing water to the refuges and other users under the different water delivery levels. Based on the results of the Water Contracting EIS's, water delivery levels will be identified for each refuge. Following completion of the Water Contracting EIS's, the plans to meet the identified water level will be compared under the National Economic Development (NED) Account, Environmental Quality (EQ) Account, and Social Account.

The beneficial and adverse effects of each alternative to provide additional water to the refuge also were compared with respect to many criteria. A summary comparison of the alternatives to provide additional water to the refuge for the various water delivery levels is presented in Table IV G-3. The following delivery alternatives have been developed to convey the identified levels of water supply described above.

1. Delivery Alternative for Level 1 (No Action Alternative)

Adequate facilities exist to deliver the current firm water supply to the GRCD. Without an influx of high quality water to GWD, 19,400 acres of wetland acres are non-floodable. If 19,400 GRCD acres (over 30%) of the GWD lands are lost as wetlands, the use-days lost would be 19,200,000 duck days, 1,280,000 goose days, 10,080,000 waterbird days and 32,000 endangered species days (ESA, 1987). No significant energy would be required under the No Action alternative.

Alternative A - Change Operation of Mendota Pool. The most feasible way to serve the GRCD during the critical months of November and December is to change the current practice of lowering the water level in the Mendota Pool in mid-November for maintenance. By delaying the reduction of water in the Mendota Pool until early December, a dependable water supply could by provided in the critical months. Rebuilding the Mendota Dam to minimize the maintenance work conducted each year may be required. Further analysis is required to determine the extent of these improvements.

TABLE IV G-3

SUMMARY COMPARISON OF WATER DELIVERY ALTERNATIVES

GRASSLAND RCD

	Supply Levels 1 & 2			Supply Levels 3 & 4		
	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Availability of Water Supply	Yes	Yes	Yes	Yes	Yes	Yes
Ability to Convey Water	Yes	Yes	Yes	Yes	Yes	Yes
Need New Water	Yes	Yes	Yes	Yes	Yes	Yes
Need New Conveyance Agreements	No	Yes	Yes	Yes	Yes	No
Type of Water Supply	Fresh Water	Fresh and Surface Ag. Return Flows	Fresh Water	Fresh Water	Fresh Water	Groundwater Blended with Fresh Water
Operational Flexibility	Good	Good	Good	Fair	Fair	Good
Wildlife Habitat	Improve	Improve	Improve	Improve	Improve	Improve
Public Use	Increase	Increase	Increase	Increase	Increase	Increase
Total Annual Costs ($)[a]	75,000	173,200	75,000	355,860	385,320	896,300

Alternative A: Change Operation of Mendota Pool
Alternative B: Zahm-Sansoni Plan
Alternative C: Wolfson Bypass
Alternative D: Almond Drive Delivery
Alternative E: Russell Aenue Delivery
Alternative F: Conjunctive Use

(a) Total Annual Costs includes annualized construction cost, annual operation and maintenance cost, annual power and wheelage cost.

Alternative B - Convey Water Under the Zahm-Sansoni Plan. The Zahm-Sansoni Plan is an alternative for supplying Delta-Mendota water to the GRCD through the existing canal systems with modifications to separate the fresh water from the agricultural return flows, as presented on Figure IV G-2. The original Zahm-Sansoni Plan has been revised several times to-date. The Grassland Task Force recently modified the plan, which is discussed below.

The San Luis Drain could convey Delta-Mendota water from an intertie located near Bass Avenue in Fresno County or at another point, to the junction of the Santa Fe Canal and the Mud Slough Bypass where a new siphon could allow the transfer of the fresh water to the Santa Fe Canal. The fresh water would mix with the usable agricultural return water in the Arroyo and Santa Fe Canal at this point. This version of the plan allows the GRCD to re-use the approximately 70 cfs of usable agricultural return flow available in the Arroyo Canal, without using Mud Slough to convey the fresh water north. Meanwhile, agricultural return flows from the Camp 13/Agatha Canal system would be diverted from the Mud Slough Bypass into the San Luis Drain at this point. The use of San Luis Drain as a conveyance system would require prior cleaning of sediments that are considered toxic.

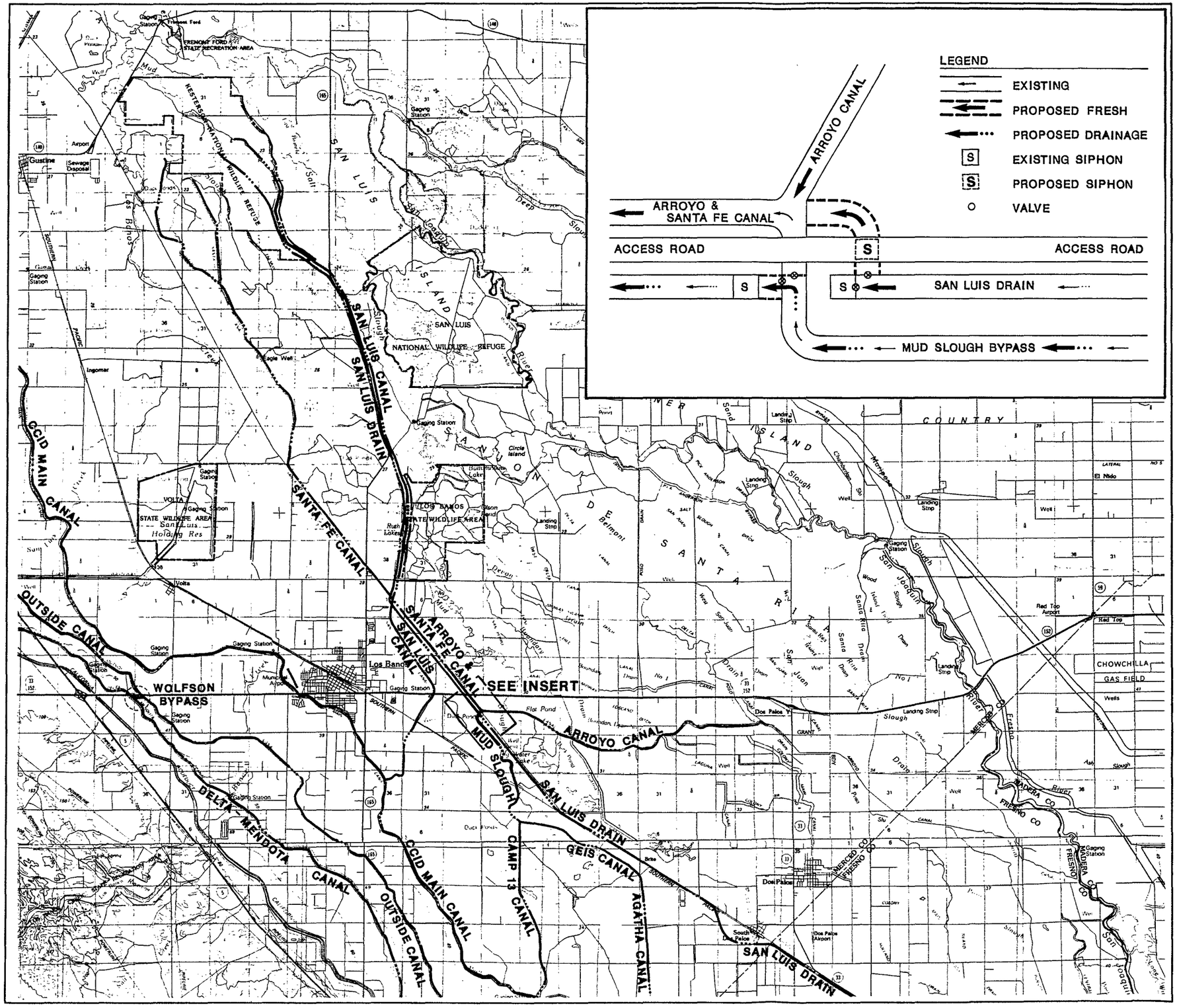
From this confluence of facilities, DMC water could be conveyed down the Main Canal to the San Luis Canal and into northern GRCD, thus delivering water to the Los Banos WMA, San Luis NWR, and the Kesterson NWR, utilizing Mud Slough.

Alternative C - Utilize the Wolfson Bypass

The CCID has an existing turnout, referred to as the Wolfson Bypass, which provides water from the Delta-Mendota Canal to the Outside Canal. This turnout is located south of Highway 152, as shown on Figure IV G-2. When water is being conveyed through the Wolfson Bypass, the flow in the Outside Canal is reversed to flow south. Water can flow north or south in the Outside Canal as a result of subsidence problems. To supply water to the reconfigured facilities under the Zahm-Sansoni Plan, water could be backed up in the Outside Canal to the existing cross-tie between the Outside Canal and the CCID Main Canal just below the Camp 13 Canal. From this point, Delta-Mendota water could be conveyed through the Camp 13 Canal. This alternative could be used during times when the Mendota Pool is drawn down for maintenance during the winter months.

2. Delivery Alternative for Level 2

This level represents the current average annual water supplied. Additional facilities would not necessarily be provided to convey water, if the existing facilities can be utilized. The use of agricultural return flows at the historic levels of use has



LEGEND

REFUGE BOUNDARY

WATER COURSE

SCALE IN FEET

0 3000 6000 12000

FIGURE IV G-2

GRASSLAND RESOURCE CONSERVATION DISTRICT

TASK FORCE PLAN

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ceased and needs to be replaced with another source of water. The decrease in salts and increased quality would result in some additional summer wildlife use and some more intensive management towards smartweed and watergrass. Water Supply Level 2 can be accommodated with the delivery alternatives for Level 1.

3. Delivery Alternative for Level 3

Under this level, construction may be required and/or the use of the existing conveyance facilities to fully serve the GRCD with an increase in water supplied.

Alternative D - Construct Turnout on Delta-Mendota Canal at Almond Drive. Under this alternative, a turnout could be constructed on the Delta-Mendota Canal at Almond Drive. 12,600 feet of unlined canal could be constructed paralleling Almond Drive to the head of the existing Almond Drive Ditch. This would require dewatering the Outside Canal and Main Canal to construct two siphons. Also, Mercey Spring Road would require a detour road for another siphon. Almond Drive Ditch would require 10,400 feet of rehabilitation.

Alternative E - Construct Turnout on Delta-Mendota Canal at Russell Avenue. A over-the-lining turnout at Russell Avenue on the Delta-Mendota Canal would be required to deliver water to the existing ditch paralleling Russell Avenue 6,000 feet. The existing ditch would require improvements northward to the Outside Canal. The Outside Canal would need to be dewatered and a 150 foot siphon constructed. A new 6,000 channel would be required northward to the Main Canal. Water would be delivered to the Main Canal upstream of the dam for diversion to the Helm Canal.

Alternative F - Implement a Conjunctive Use Program. Groundwater could be used during an emergency in conjunction with surface water at times when the Mendota Pool is drawn down and the CCID cannot transport an adequate amount of water. The groundwater could be mixed with surface water to reduce the boron concentrations. Wells would need to be constructed around existing internal conveyance facilities, namely the Santa Fe and San Luis Canals in the north, and the Agatha/Geis/Camp 13 systems in the southern division of the GRCD.

4. Delivery Alternative for Level 4

Under this level, construction and/or the use of the existing conveyance facilities may be required to fully serve the already developed areas as well as areas which have not yet been developed within the GRCD. This level would provide additional water over the course of the year to improve habitat in the GRCD. Water Supply Level 4 could be accommodated with the delivery alternatives for Level 3.

5. Summary of Alternatives

Alternative A requires improvements to the Mendota Dam and pool facilities to reduce the amount of time that the Pool is drawn down for maintenance. The required improvements are unknown at this time. Alternative B requires a reconfiguration of the existing canal system for supplying usable water to the grasslands area. Alternative C, utilizing the Wolfson bypass, does not require construction of additional facilities but it is an adequate solution only for the short-term due to its conveyance limitations. This alternative can be used in conjunction with Alternative B as a source of fresh water to Mud Slough. Alternatives D and E would require long-term conveyance agreements as well as extensive improvements to existing canal structures. Alternative F could be used during emergencies or when the Mendota Pool is drawn down but this alternative would require expensive pumping costs and blending to improve the poor quality water.

Alternative B would benefit not only the private duck clubs within the GRCD, but also the GWD, San Luis NWR, Los Banos NWR, and Kesterson NWR. The plan is viable as long as the Wolfson Bypass is used as a delivery point. When water goes to the pool, not only is the quality degraded but the water loss is increased by a minimum of ten percent. Alternative C and Alternative E would have to be employed to assure water conveyance to the entire southern GRCD.

C. COSTS AND ECONOMIC ANALYSIS

Costs of the alternative plans for providing adequate water supplies under the Water Delivery Levels 1,2 3, and 4 are presented in Table IV G-4 and the Cost Estimates Appendix. The construction costs include factors to cover engineering, contingencies, and refuge overhead. During the advanced planning phase, these costs will be refined further.

Construction of the improvements under the preferred plans to provide Level 1, 2, 3, and 4 water deliveries would result in additional money being spent in Merced County during construction. The construction could be completed within one summer season by construction workers who reside in Merced or Fresno County.

Currently, the annual public use to GRCD is about 125,000 consumptive, and 13,000 non-consumptive use-days per year. If water is provided throughout the year, the public levels would increase, significantly.

D. WILDLIFE RESOURCES

The annual waterfowl use in the GRCD is approximately 95,600,250 use-days. Approximately 63 and 4 percent of the waterfowl use are by ducks and geese, respectively. Waterbird

TABLE IV G-4

SUMMARY OF ESTIMATED COSTS OF ALTERNATIVES

GRASSLAND RESOURCE CONSERVATION DISTRICT

Items	Water Delivery Levels 1 & 2 Alternatives A	B	C
Total Construction Costs	0	$1,000,000	0
Power Costs ($/acre-foot)	0.00	0.00	0.00
Water Wheeling Cost ($/acre-foot)	1.00	1.00	1.00
Annualized Construction Costs (8.875%, 30 years)	0	96,200	0
Annual Operations & Maintenance Costs	0	2,000	0
Annual Power Costs	0	0	0
Annual Water Wheelage Costs	75,000	75,000	75,000
Total Annual Costs	$ 75,000	$ 173,200	$ 75,000

Alternative A - Change Operation of Mendota Pool

Alternative B - Convey water under the Zahm-Sansoni Plan (Siphon Const.)

Alternative C - Utilize the Wolfson Bypass

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TABLE IV G-4
(continued)

SUMMARY OF ESTIMATED COSTS OF ALTERNATIVES

GRASSLAND RESOURCE CONSERVATION DISTRICT

Items	Water Delivery Levels 3 & 4 Alternatives D	E	F
Total Construction Costs	$2,300,000	$2,600,000	$2,091,000
Power Costs ($/acre-foot)	0.00	0.00	8.70
Water Wheeling Cost ($/acre-foot)	1.00	1.00	0.00
Annualized Construction Costs (8.875%, 30 years)	221,260	250,120	201,150
Annual Operations & Maintenance Costs	4,600	5,200	73,100
Annual Power Costs	0	0	622,050
Annual Water Wheelage Costs	130,000	130,000	0
Total Annual Costs	$ 355,860	$ 385,320	$ 896,300

Alternative D - Construct Turnout on Delta-Mendota at Almond Drive

Alternative E - Construct Turnout on Delta-Mendota at Russell Avenue

Alternative F - Conjuctive Use

use is approximately 33 percent. Listed threatened and endangered species have been noted for the entire GRCD. These include the San Joaquin kit fox, Vulpes macrotis mutica, the Valley elderberry longhorn beetle, Desmocerus californicus dimorphus, and the Aleutian Canada goose, Branta canadensis leucopareia. Numerous candidate species may occur in this area and are also presented in Table IV G-5. The improved habitat would increase the number of wildlife use days and recreational benefits, as presented in Table IV G-6.

Implementation of the alternative plans may not adversely effect the listed and candidate threatened and endangered species of birds. Detailed field investigations would be completed during the advanced planning phase of the project. Implementation of the plans may result in overall beneficial environmental effects. However, the water quality of the agricultural return flows should be analyzed prior to implementation. The No Action Plan would result in the continued management of most of the GRCD at lower levels without additional water. The results of the preliminary environmental analysis for the alternative plans are presented in the Environmental Appendix. Additional environmental analyses would be completed as part of the Water Contracting EIS's.

E. SOCIAL ANALYSIS

The social consequences of constructing and operating the selected alternative plans should be positive due to the potential increase in wildlife use and subsequently public use. The local social environment is discussed in the Social Appendix.

F. POWER ANALYSIS

Pacific Gas and Electric (PG&E) serves the GRCD under the PA-1 rate schedule for agricultural users. A facility must be an authorized function of the CVP to receive project-use power. The authority to deliver CVP power to the refuge is currently being examined and will be detailed in the Refuge Water Supply Planning Report. A more detailed discussion of project-use power and wheeling agreements is provided in the Power Analysis section of Chapter IV B.

G. PERMITS

Construction activities would require several permits. Merced County would issue approvals to ensure that the existing drainage facilities would not be adversely effected. If additional water is transferred through the California Aqueduct, approvals from the DWR would be required. If the CCID facilities are utilized, their approval is required. If water rights are to be obtained or modified, the State Water Board would be granting the permits. Stream Alteration Permits would be required from the DFG and an Army Corps of Engineers permit would be required for construction activities in wetlands or riparian corridors.

TABLE IV G-5

LISTED, PROPOSED, & CANDIDATE, THREATENED & ENDANGERED SPECIES

GRASSLANDS RESOURCE CONSERVATION DISTRICT

Listed Species

Mammals
San Joaquin kit fox, Vulpes macrotis mutica (E)

Birds
Aleutian Canada goose, Branta canadensis leucopareia (E)
Bald Eagle, Haliacetus leucocephalus (E)
Peregrine Falcon, Falco peregrines (E)

Invertebrates
Valley elderberry longhorn beetle, Desmocerus californicus dimorphus (T)

Proposed Species

None

Candidate Species

Birds
Tricolored blackbird, Agelaius tricolor (2)
White-faced ibis, Plegadis chihi (2)
Western Snowy Plover, Charadrus alaxandrinus

Reptiles
Giant garter snake, Thamnophis couchi gigas (2)
California tiger salamander, Ambystoma tigrinium californiense (2)

Invertebrates
Molestan blister beetle, Lytta molesta (2)

Plants
Hispid bird's-beak, Cordylanthus mollis subsp. hispidus (2)
Delta coyote-thistle, Eryngium racemosum (1)
Bearded allocarya, Plagiobothrys hystriculus (2)
Valley spearscale, Atriplex patula subsp. spicata (2)

Source: USFWS, June 4, 1987

(E)—Endangered (T)—Threatened (CH)—Critical Habitat
(1)—Category 1: Taxa for which the Fish and Wildlife Service has sufficient biological information to support a proposal to list as endangered or threatened.
(2)—Category 2: Taxa for which existing information indicated may warrant listing, but for which substantial biological information to support a proposed rule is lacking.

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TABLE IV G-6

WILDLIFE RECREATIONAL BENEFITS AND RESOURCE IMPACTS

GRASSLAND RCD

Item	Water Delivery Levels			
	Level 1	Level 2	Level 3	Level 4
Habitat Acres				
Permanent Water	200	2,000	3,000	4,000
Seasonal Marsh	54,800	51,000	48,500	46,000
Smartweed & Watergrass	1,000	3,000	4,500	6,000
Bird Use Days				
Ducks	60,000,000	80,000,000	90,000,000	100,000,000
Geese	5,000,000	7,000,000	8,000,000	9,000,000
Waterbirds	30,000,000	40,000,000	45,000,000	50,000,000
Endangered Species	180,000	210,000	230,000	250,000
Public Use Days				
Consumptive	60,000	70,000	75,000	80,000
Non-consumptive	20,000	25,000	27,500	36,000
Annual Recreational Benefits	$1,732,800	$2,057,700	$2,220,150	$ 2,512,560

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